

# RADIO - ELECTRONICS

formerly

**RADIO CRAFT**

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Eight-Tube Televiser  
Survey of Multitesters

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Editor

FIRST NON-PRO  
EXPERIMENTAL  
TV RELAY  
STATION

SEE TELEVISION SECTION

1949 RADIO PARTS SHOW  
MAY 17 - 20  
HOTEL STEVENS, CHICAGO



MAY  
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LATEST IN RADIO - ELECTRONICS - TELEVISION

# Experimental TV Relay

## Enthusiasts organize to help televiewers

LANCASTER, Pennsylvania, is only 65 miles from Philadelphia. But it is in a valley with a range of hills (the Welsh Mountains) between it and the city. What would be a "fringe area" is thus almost a "null area" because of these hills, and the few experimenters who purchased televisions and erected tall antennas reported the situation to be absolutely hopeless.

But the television experimenters refused to give up and sit quietly waiting for television to come to Lancaster. They went out and got it. Reception from Philadelphia is excellent on the Welsh Mountains. Television enthusiasts began to wonder about bending the rays from Philadelphia's television stations over the mountains and down into Lancaster.

Lancaster has plenty of television enthusiasts. One of the large plants of Radio Corporation of America is located there, and the town has a very high percentage of radio engineers and technicians in its population. A group of them met in April, 1945, to "find ways and means to bring television to the homes of Lancaster." They decided that a relay station on the Welsh Mountains, 15 miles away might be the best answer.

Inquiries showed that Philadelphia television stations would grant permission to relay their programs. The group of enthusiasts organized the Conestoga Television Association in September, 1945, and have worked steadily ever since "to bring television to the homes of Lancaster."

Result of the effort is experimental television station W3XBR, shown on our cover this month. During the winter of 1948-49 it made programs available on a more or less regular basis four nights a week. Quality of picture is usually equal to that in the best receiving locations, stability is excellent and there is little or no trouble from "snow" or man-made noise.

All work has been done on a strictly amateur basis. Members of the Association take turns in operating the station. But the Conestoga group do not use the word "amateur" in describing their activities. They point out that the word



R. E. Barrett of the Conestoga Television Association at the W3XBR controls.

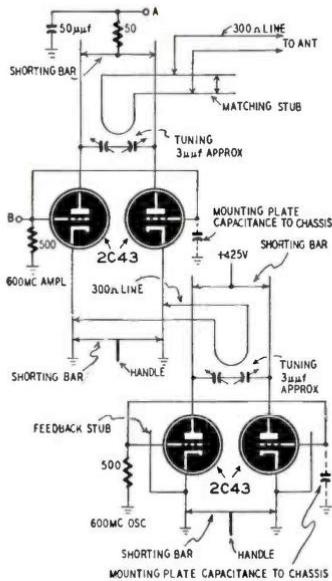
has a very definite meaning in the radio world, and that they are not hams, nor is their station licensed for operation on an amateur frequency. W3XBR is an experimental station, and the members who operate it have commercial licenses.

### Transmitting equipment

The video transmitter operating on 600 mc uses four 2C43 10-watt light-house triodes, two in the oscillator and two in the final amplifier. The output is about 7 watts. The tubes are connected in a tuned-line circuit as shown in Figs. 1, 2, and 3. The lines are resonated by the shorting bars which slide along the plate and cathode lines. In addition, small split-stator capacitors, consisting of plates mounted on a shaft so they may be moved toward or away from the plate lines, act as vernier tuners on both the oscillator and the amplifier stages.

Oscillator and amplifier are identical with the exception of the oscillator feedback stubs, which extend from the cathode toward the grid of each oscillator tube through the copper chassis, which acts as a shield. Fig. 2 is a plan of the oscillator and Fig. 3 one of the amplifier. Thus the stubs appear in Fig. 2 only.

A number of modulation systems were tried. The transmitter was first grid-modulated with a low-power, 4-tube modulator which used receiving-type tubes and which connected to point B in Fig. 1. Modulation was about 50%. To approach 100% modulation, a much more ambitious circuit had to be designed. The present modulator has 5 stages feeding a power stage which consists of six 4E27/8001's in parallel. Their output goes to point A in Fig. 1. The circuits of the modulation amplifier appear in Fig. 4, and one of the six identical parallel sections of the modu-



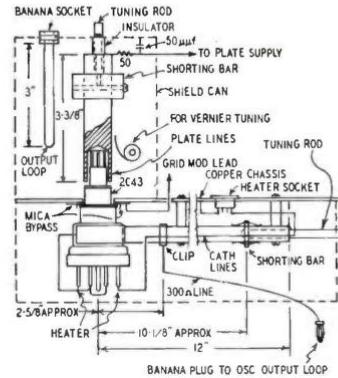
The sound transmitter is identical to the video transmitter illustrated in Fig. 1, having been originally constructed as the standby unit. In the earlier experimental stages, AM was used, but the modulation now follows standard television practice—frequency modulation with the sound r.f. at the standard frequency separation from the video signal. The sound transmitter is completely independent and has its own antenna.

## **Receiver converters**

But getting the signals into Lancaster was only half the story. The 600-mc frequency for which the station was licensed had to be converted to one that could be picked up by a standard television receiver. This problem was solved with the experimenter's standby, surplus equipment. The former Navy radar receiver ASB-6 was adapted for the job. This versatile unit can be made into a converter that will either work from the u.h.f. band down to Channel 2, or will produce video signals directly with its own detector.

First stage of the converter (Fig. 6) is a 2C40 lighthouse tube. It feeds into an oscillator-mixer stage consisting of a pair of 955's, which brings the signal to 54 mc for the first i.f. section. This consists of two stages, and the 54-mc signal from it can be coupled into the antenna circuit of a standard TV receiver, whose Channel 2 circuits may have to be retuned slightly for best possible performance.

Better results can be obtained by heterodyning again and amplifying through another two i.f. stages at 10 mc, which in the ASB-6 is followed by a detector and one video stage. Since the converter problem has been solved by each member of the Association in his



own way, both of the systems mentioned in addition to a few variations are in use.

## **Antenna system**

The mast which decorates this month's cover is a 65-foot tower originally built for experimental work by a windmill company. Receiving antennas increase the height another 13 feet, making 78 feet overall. Each receiving array is a pair of stacked Taco dipoles, one being

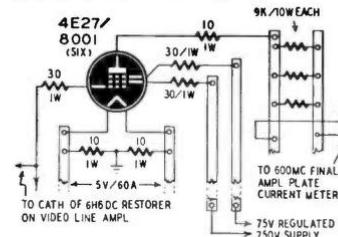


Fig. 5—Modulator has six parallel 8001 tubes.

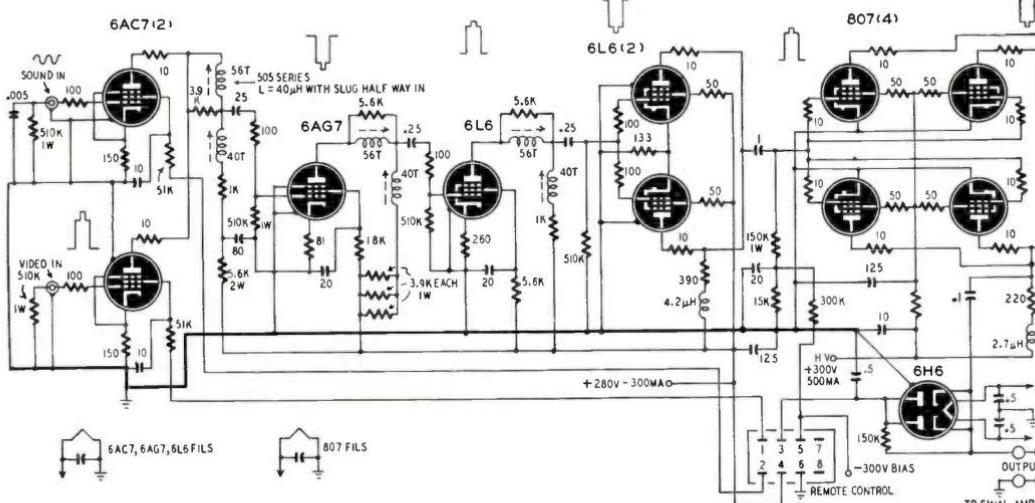


Fig. 4—A simple modulation circuit was tried at first but it was found that a more elaborate job was needed. This is the line amplifier.

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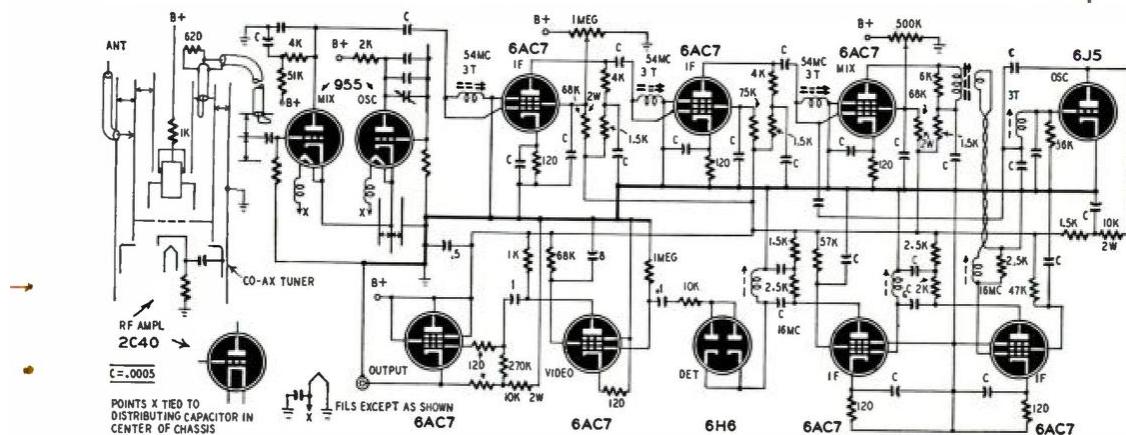


Fig. 6—A surplus ASB-6 radar receiver is used by most viewers to convert the 600-mc signal of W3XBR to one suitable for the TV receiver.

used for reception from WPTZ and one for WCAU. The two corner reflectors immediately below were originally for the sound and vision transmitting antennas. Now the video channel is transmitted from the large parabola below the reflectors, while four stacked vertical dipoles in one of the reflectors transmit the audio channel.

The television situation in Lancaster is a triumph of organized effort. Though any person who desires to receive the signals could do so simply by constructing a converter, without taking on the burdens of membership in the Association, there are no "pirates" and every televiwer is an active worker in the

organization, doing such duties as his qualifications permit. The encouragement of outside organizations, notably the television stations in Philadelphia who permitted their programs to be relayed, and RCA in Lancaster, who loaned the new station much necessary material which might have been too costly to buy, also played an important part.

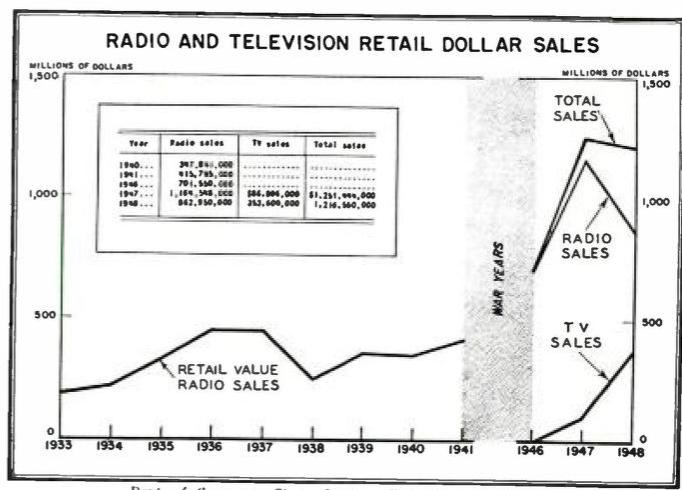
Lancaster expects a local commercial television station whose programs will probably start in June. How the long-distance relay will be affected is not known, but Association members are looking forward to the changed situation with interest. Will members who

have been accustomed to receiving two stations be content with the single home-town program? And will the operators who have been spending their evenings on Welsh Mountain feel it worth while to continue to do so if television programs are otherwise available? Will W3XBR continue, cease, or change its form of operation? No one knows the answers, but all members of the Conestoga Television Association agree that the work up to the present has already paid off in satisfaction over a job well done, and in television training that could not have been so well obtained in any other, less practical way.

## TV SALES TO REACH NEW HIGH IN 1949

**T**V RECEIVER SALES may bring as much income to radio manufacturers as sales of sound sets in 1949, according to a report released last month by the U. S. Department of Commerce. Written by James B. Forman and Charles P. Redick of the Department and entitled "Trends and Prospects in Radio and Television Receivers," the report relates that TV retail dollar volume amounted to less than 7% of total industry sales in 1947, but jumped to 30% in 1948. If the industry's objective of producing two million TV receivers in 1949 is realized, say the authors, the decline of radio sales and the growth of the television market may well cause a meeting or even crossing of the radio and TV lines on the sales chart shown. Aggregate sales of radio and TV receivers in 1949 is expected to approach the \$1.2 billion reached in 1948, despite the approach to saturation in table-model radio receivers and the slump in radio-phonograph combinations caused by confusion over phonograph records.

The increase in the number of TV set makers is very marked. Before the war only one company was manufacturing



Dept. of Commerce Chart. Source: Electrical Merchandising

televiwers; forty were in the business (or preparing to enter) in mid-1946 and 76 in mid-1948, all but 18 of whom are also active in radio.

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